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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/760,554	01/21/2004	Tatsuya Usami	029437-0103	8646
22428	7590	08/25/2006	EXAMINER	
FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007			WILLIAMS, ALEXANDER O	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 08/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/760,554	Applicant(s) USAMI ET AL.	
	Examiner Alexander O. Williams	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 10-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5/23/06</u> . | 6) <input type="checkbox"/> Other: _____ |

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Serial Number: 10/760554 Attorney's Docket #: 029437-0103

Filing Date: 1/21/2004; claimed foreign priority to 1/31/2003

Applicant: Usami et al.

Examiner: Alexander Williams

This action is in response to the telephone call from Applicant's Representative on 8/7/06 to inform the Examiner an IDS filed 5/23/06 has NOT been considered.

The last office action field 6/7/06 is withdrawn and replaced with this office action.

The indicated allowability of claims 1 and 3-9 are withdrawn in view of the newly discovered reference(s) to Nakata et al. Rejections based on the newly cited reference(s) follow.

Applicant's election of the species of figure 9D (claims 1 and 3 to 9) has been acknowledged.

This application contains claims 10 to 16 drawn to an invention non-elected with traverse. A complete response to the final rejection must include cancellation of non-elected claims or other appropriate action (see 37 CFR § 1.144 & MPEP § 821.01).

Claim 2 has been cancelled.

The disclosure is objected to because of the following informalities: Applicant's related application information should be updated.

Appropriate correction is required.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3 to 6, 8 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakata et al. (U.S. Patent # 6,958,525 B2).

1. Nakata et al. (figures 1 to 7) specifically figure 5 show a semiconductor device comprising: a semiconductor substrate **1**; a first insulating film **26** formed on an upper side of said semiconductor substrate, said first insulating film consisting essentially of ladder-shaped siloxane hydride; and a second insulating film **27** disposed adjacent to said first insulating film, said second insulating film containing oxygen and silicon as constituent elements.

Brief Summary Text - BSTX (15):

According another aspect of the invention, there is provided a low dielectric constant film made of siloxane resin and polycarbosilane bonded to the siloxane resin.

Brief Summary Text - BSTX (16):

According to another aspect of the invention, there is provided a semiconductor device comprising a semiconductor substrate and a dielectric film disposed on the principal surface of the semiconductor substrate and made of low dielectric constant material containing siloxane resin and polycarbosilane bonded to the siloxane resin.

Brief Summary Text - BSTX (17):

By adding polycarbosilane to siloxane resin, resistance against alkaline of a siloxane resin film can be improved.

Brief Summary Text - BSTX (18):

According to another aspect of the present invention, there is provided a semiconductor device comprising: a semiconductor substrate; a first film formed on a surface of the semiconductor substrate and made of a first silica-containing porous material;

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and a second film directly formed on the first film and made of a second silica-containing porous material, the second silica-containing porous material having an etching rate different from an etching rate of the first silica-containing porous material under a same etching condition.

Detailed Description Text - DETX (3):

Siloxane resin may be those materials expressed by the following general chemical formula: ##STR1##

Detailed Description Text - DETX (4):

R.sub.1 to R.sub.3 represent hydrogen, oxygen or a monovalent hydrocarbon group such as a methyl group, an ethyl group and a phenyl group, and X represents hydrogen or Si. The number n.sub.1 of monomer units is 5 to 200. If R.sub.1 to R.sub.3 are oxygen, the group X is bonded to the oxygen atoms. If X is Si, a main chain (--Si--O--) extends from this Si atom. The resin expressed by the general chemical formula may be: resin formed by a sol-gel process by using, as source material, tetraalkoxysilane, trialkoxysilane, methyltrialkoxysilane, or the like; resin formed by a sol-gel process by using a mixture of these source materials; resin formed by a sol-gel process by using, as source material, tetraalkoxysilane and dimethylalkoxysilane; and other resin.

Detailed Description Text - DETX (5):

Siloxane resin may also be those ladder type materials expressed, for example, by the following general chemical formula: ##STR2##

Detailed Description Text - DETX (6):

At least one of R.sub.4 to R.sub.7 represents hydrogen, and the others represent hydrogen, oxygen or a monovalent hydrocarbon group such as a methyl group, an ethyl group and a phenyl group. The number n.sub.2 of monomer units is 5 to 100. The resin expressed by the general chemical formula may be hydrogen silsesquioxane, methyl silsesquioxane, fluorine-containing hydrogen silsesquioxane or the like.

Detailed Description Text - DETX (8):

R.sub.8 and R.sub.9 represent hydrogen or a monovalent hydrocarbon group such as a methyl group, an ethyl group and a phenyl group, and X represents hydrogen or Si. The number m of monomer units is 20 to 1,000.

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Detailed Description Text - DETX (9):

Usable solvent is not particularly limited if it can dissolve siloxane resin and polycarbosilane. For example, usable solvent may be cyclohexanone, methyl isobutyl ketone, methyl ethyl ketone, methyl cellosolve, ethyl cellosolve, octane, decane, propylene glycol, propylene glycol monoethylether, propylene glycol monoethylether acetate, or the like.

Detailed Description Text - DETX (11):

The inventors have found that siloxane resin added with polycarbosilane is given a nature of repelling alkaline solution. A low dielectric constant film made of the above-described material is easy to repel alkaline solution. Therefore, even if a semiconductor substrate with a low dielectric constant film made of such material is worked in alkaline solution, hydrolysis of the film by alkaline solution can be suppressed and an increase in the dielectric constant can be suppressed.

Detailed Description Text - DETX (26):

Solution of trichlorosilane of 41 g (0.3 mol) at a concentration of 20 weight % dissolved in toluene is dripped from the quantitative pump at 2 ml/min. After dripping, an aging process is performed for two hours. With this aging, ladder type siloxane resin is synthesized. After these processes, fluoric acid solution of 100 ml at a concentration of 50 weight % is added to then remove precipitated toluenesulfonic acid. Excessive fluoric acid solution is removed by using a separatory funnel.

Detailed Description Text - DETX (37):

Next, an alkaline resistance of a low dielectric constant film will be described. The surface state of a low dielectric constant film was observed after it is immersed for one minute in tetramethylammonium hydride solution at a concentration of 2.38%. Cracks formed in the films were observed in comparison examples without polycarbosilane and comparison examples with polycarbosilane of five weight parts. No crack was observed in the films of the first to fourth embodiments with polycarbosilane at 10 to 300 weight parts. It is therefore preferable to set the addition amount of polycarbosilane to 10 weight parts relative to siloxane resin of 100 weight parts, in order to retain a high alkaline resistance.

Detailed Description Text - DETX (68):

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or ladder type siloxane resin expressed by the following general chemical formula: ##STR5##

Detailed Description Text - DETX (69):

R.sub.10 to R.sub.12 represent hydrogen, oxygen or a monovalent hydrocarbon group, and R.sub.13 to R.sub.16 represent hydrogen, fluorine or a monovalent hydrocarbon group. n.sub.1 is an integer of 5 to 200, and X represents hydrogen or silicon. n.sub.2 is an integer of 5 to 100.

Detailed Description Text - DETX (71):

The present inventors have found that an etching rate can be changed by changing side chains of siloxane resin or ladder type siloxane resin. Specifically, if the material has only hydrogen or a methyl group as side chains, the etching rate of the material by fluoric plasma becomes three times or more faster than such a material as at least one side chain in one monomer unit is a phenyl group or a hydrocarbon group having two or more carbon atoms. In the tenth embodiment, the materials of the films 61 and 63 are selected so that the etching rate of the upper low dielectric constant film 63 becomes three times or more faster than that of the upper low dielectric constant film 61.

Detailed Description Text - DETX (86):

The material of the upper low dielectric film may be: siloxane resin used by the tenth embodiment; resin produced by a sol-gel method using tetraalkoxysilane, trialkoxysilane, methyltrialkoxysilane or the like as source material; resin produced by a sol-gel method using a mixture of these source materials; resin produced by a sol-gel method using tetraalkoxysilane and dimethylalkoxysilane as source materials; or other resin. Ladder type resin may be hydrogen silsesquioxane, methylsilsesquioxane, fluorine-containing hydrogen silsesquioxane or the like.

Detailed Description Text - DETX (87):

The material of the lower low dielectric film may be: siloxane resin used by the tenth embodiment; and resin produced by a sol-gel method using phenyltrialkoxysilane. Ladder type resin may be phenylsilsesquioxane or the like. Resin containing a hydrocarbon group with 2 to 5 carbon atoms as at least one of side chains may be resin produced by a sol-gel method using at least one source material selected from a group consisting of

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ethyltrialkoxysilane, propyltrialkoxysilane, normal-butyltrialkoxysilane, and tertiary-butyltrialkoxysilane.

3. The semiconductor device according to claim 1, Nakata et al. show wherein said second insulating film comprises a compound selected from the group consisting of **SiO₂**, SiOC, SiON and SiOF.

4. The semiconductor device according to claim 1, Nakata et al. further comprising a metal interconnect **30** embedded in a multilayer structure, said multilayer structure comprising said first insulating film and said second insulating film.

5. The semiconductor device according to claim 1, Nakata et al. show wherein said semiconductor device is free of a guard ring.

6. The semiconductor device according to claim 1, Nakata et al. show wherein said ladder-shaped siloxane hydride has a dielectric constant higher than 2.9.

As to claims 8 and 9, Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakata et al. (U.S. Patent # 6,958,525 B2).

Initially, and with respect to claim 7, note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases as the above case law makes clear.

As to Claim 7, the grounds of rejection under section 103, see MPEP § 2113.

Response

Applicant's arguments filed 3/20/06 have been fully considered, but are moot in view of the new grounds of rejections detailed above.

The listed references are cited as of interest to this application, but not applied at this time.

Field of Search	Date
U.S. Class and subclass: 257/758,760,762,751,753,761,754,759,e23.144	12/11/05 5/23/06 8/9/06
Other Documentation: foreign patents and literature in 257/758,760,762,751,753,761,754,759,e23.144	12/11/05 5/23/06 8/9/06
Electronic data base(s): U.S. Patents EAST	12/11/05 5/23/06 8/9/06

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander O. Williams whose telephone number is (571) 272 1924. The examiner can normally be reached on M-F 6:30AM-7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272 1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alexander O Williams
Primary Examiner
Art Unit 2826

AOW
8/9/06